

STUDY OF ${}^7\text{He}$ USING THE $d({}^6\text{He},p){}^7\text{He}$ REACTION

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We have studied the $d({}^6\text{He},p){}^7\text{He}$ reaction using a ${}^6\text{He}$ beam to study the properties of the exotic, neutron-rich nucleus ${}^7\text{He}$. The nucleus ${}^7\text{He}$, which possesses no particle-bound states, is one of the simplest nuclei for which there remains considerable debate about its structure. The structure of ${}^7\text{He}$ is particularly interesting in light of the current interest in systems containing many loosely bound neutrons. In addition to the well established ground state [1], several experimental efforts have been made to understand the properties of possible excited states of this system [2-4]. In one of these [4] it has been suggested that there may exist a low-lying level that possesses significant overlap with ${}^6\text{He}_{\text{g.s.}}+n$, and should thus be populated strongly in the $d({}^6\text{He},p){}^7\text{He}$ reaction.

To examine the properties of possible low-lying excited states in this nucleus, we have studied the inverse-kinematic reaction $d({}^6\text{He},p){}^7\text{He}$ using a radioactive ${}^6\text{He}$ beam produced at the in-flight facility at the ATLAS accelerator at Argonne National Laboratory. Backward emitted protons were detected using an array of segmented annular silicon detectors, and coincident ${}^4,{}^6\text{He}$ ions were detected and identified using an array of silicon EΔE telescopes at very forward angles. Figure 1 shows a representative Q-value spectrum. The experimental results will be compared with theoretical predictions and other data for excited states in ${}^7\text{He}$.

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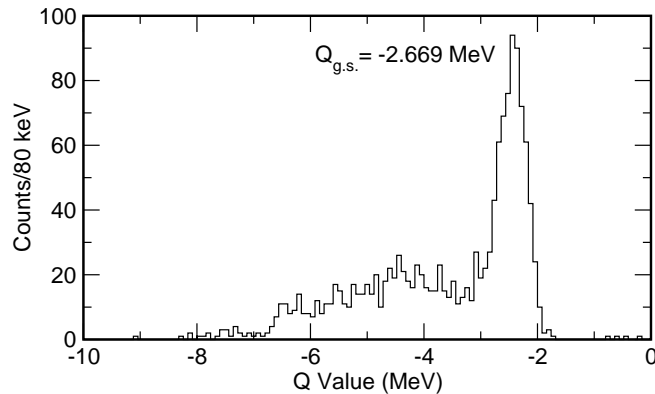


Figure 1. Proton Q-Value spectrum from the $d({}^6\text{He},p){}^7\text{He}$ reaction for $110^\circ \leq \theta_p \leq 160^\circ$.